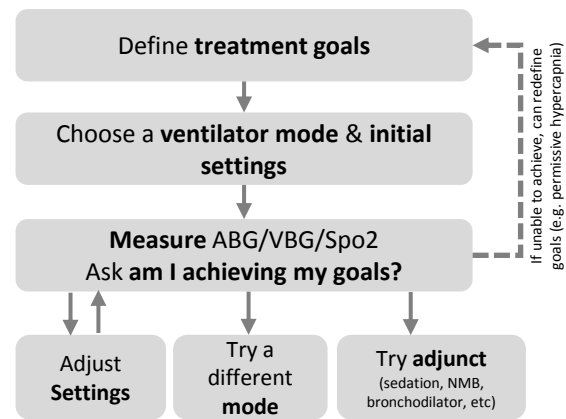


# OVERVIEW OF VENTILATOR MODES



## Goals for mechanical ventilation:

1. **Oxygenation** – support PaO<sub>2</sub>/SpO<sub>2</sub>
2. **Ventilation** – maintain pH
3. **Patient comfort** – vent synchrony, ↓ sedation
4. **Facilitate weaning** – minimize muscle loss, promote readiness to wean from support

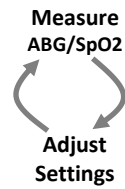
## Ventilator Modes:

Fall into two broad categories: **pressure** and **volume** modes. Each mode has three features:

- Trigger (T) – what initiates a breath?
- Cycle (C) – what ends a breath?
- Limit (L) – what stops a breath early?

Each mode has Pro's and Con's to consider.

## Measurement and optimization:



ABG: pH / PCO<sub>2</sub> / PaO<sub>2</sub> / HCO<sub>3</sub><sup>-</sup>  
 Pulse Ox: SpO<sub>2</sub>

### VENTILATION

If you want to increase the pH → increase the ventilation parameters

### OXYGENATION

If you want to change the PaO<sub>2</sub> or SpO<sub>2</sub> adjust oxygenation parameters (FIO<sub>2</sub> and PEEP)

Mode	Description	Pro's	Con's	Major settings / example	Monitor
<b>VC</b> Volume Control (a.k.a. assist control volume)	Every breath delivered (mandatory and patient triggered) are all the same set <b>volume</b> T – time/pressure/flow, C – volume, L – volume	Good general-purpose mode; Ensures a minimum MV is achieved. Good mode for lung protective ventilation ( <a href="#">LPV</a> )	Requires you to monitor pressures to avoid barotrauma. (See my <a href="#">OnePager</a> on ARDS for details.)	<b>RR, TV, PEEP, FIO<sub>2</sub></b> <b>12 bpm, 450cc, +8, 60%</b> <i>(RR – respiratory rate, TV – tidal volume)</i>	Pressures (Ppeak, Pplat)
<b>PC</b> Pressure Control (a.k.a. assist control pressure)	Every breath delivered (time & patient) are a set <b>pressure</b> for a set time T - time/pressure/flow, C – time, L - pressure	Good for limiting pressure; may be more comfortable for select patients. Also can be used for LPV (no difference in <a href="#">mortality</a> )	Requires you to monitor volumes to avoid volutrauma or hypoventilation	<b>RR, IP, T<sub>i</sub>, Risetime, PEEP, FIO<sub>2</sub></b> <b>12 bpm, 25 cmH<sub>2</sub>O, 0.9 sec, 0.15 sec, +8, 60%</b> <i>(IP – inspiratory pressure, T<sub>i</sub> – inspiratory time)</i>	Volumes (TV, MV)
<b>PRVC</b> Pressure Regulated Volume Control (a.k.a. VC+)	<b>Hybrid</b> PC mode that dynamically changes inspiratory pressure to deliver a desired volume T - time/pressure/flow, C – volume, L - volume	Guarantees TV but delivers pressure-controlled breaths; (e.g. low risk of causing VILI), which potentially may be more comfortable for patients	In patients who are struggling to breathe the machine will provide less support	<b>RR, TV, T<sub>i</sub>, Risetime, P<sub>max</sub>, PEEP, FIO<sub>2</sub></b> <b>12 bpm, 450cc, 0.9 sec, 0.15 sec, 30 cmH<sub>2</sub>O, +8, 60%</b> <i>(P<sub>max</sub> – maximum pressure)</i>	Pressures & volumes
<b>SIMV</b> Synchronous Intermittent Mandatory Ventilation	Delivers mandatory breaths with a fixed volume but patient <b>can't</b> trigger (patient breaths are not the same as mandatory breaths); can use PS T – time , C – volume, L - volume	May be useful for patients with hiccups to avoid alkalemia	Seldom used; not effective for weaning; often found to be uncomfortable	<b>RR, TV, PEEP, FIO<sub>2</sub></b> <b>12 bpm, 450 cc, +8, 60%</b>	Pressure (Ppeak Pplat)
<b>PS</b> Pressure Support	<b>All</b> breaths are patient initiated; ventilation determined solely by patient (no backup rate). T – pressure/flow, C – flow, L - pressure	<a href="#">Ideal weaning mode</a> (used in SBTs and for prolonged periods); <a href="#">most comfortable</a> because it allows patient to control ventilation	Does not guarantee a rate; need to monitor to ensure adequate ventilation	<b>PS, PEEP, FIO<sub>2</sub></b> <b>+10, +5, 40%</b> <i>Note that PS is above PEEP so "Ten over Five" PIP = 15cmH2O</i>	Volumes (TV, MV)
<b>APRV</b> Airway Pressure Release Ventilation (a.k.a. Bi-Vent)	<b>Inverse ratio ventilation</b> (e.g. I time > E time) that allows patient to breath spontaneously; can combine w/ PS T – time, C – time, L - pressure	Great for ARDS patients who are spontaneously breathing (e.g. not on NMB); <a href="#">may improve comfort &amp; oxygenation</a> (but <a href="#">no mortality benefit</a> )	Complex mode/settings; Risk of VILI if settings are done improperly; doesn't make sense if on NMB	<b>T<sub>High</sub>, T<sub>Low</sub>, P<sub>high</sub>, P<sub>low</sub>, FIO<sub>2</sub></b> <b>5.5 sec, 0.5 sec, 25 cmH<sub>2</sub>O, 0 cmH<sub>2</sub>O, 60%</b> <i>(Thigh/low – time high/low, Phigh/low – pressure high/low Note that P<sub>low</sub> is analogous to PEEP)</i>	Volumes & gas exchange PCO <sub>2</sub> / EtCO <sub>2</sub>